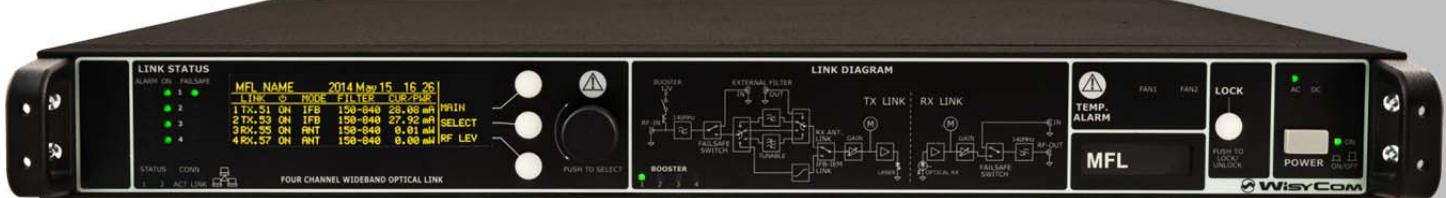


# MFL User Manual

## RF over Fiber System

- ✓ Up to 4 ch's in a single mode fiber
- ✓ Diversity reception antenna remoting
- ✓ IFB transmissions remoting
- ✓ Integrated tunable filters
- ✓ Optical & RF power meter
- ✓ Ethernet conn. for remote control



SN: \_\_\_\_\_

rev.02 (ref. FW 1.1)

Date: 23 April, 2014



## BRIEF DESCRIPTION

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MFL provides wideband optical link for up to 4 RF channels combined in one single mode fiber thanks to CWDM technology. It is designed to allow for a flexible and modular configuration thanks to a mainboard that can be fitted with up to 4 plug-in boards that can be chosen any combination of two types:

- TX: Laser optical transmitter, (CDWM) plug-in board
- RX: Optical-receiver plug-in board

*Example of some possible configurations:*

- *MFL-TTTT is a 4 laser transmitters on channel 51/53/55/57 ( $\lambda = 1510/1530/1550/1570$  nm).*
- *MFL-RRRR is a 4 optical receiver on channel 51/53/55/57*
- *MFL-RRTT has 2 receiver on ch. 51/53 and 2 transmitters ch. 55/57 (it works with MFL-TTRR)*
- *MFL-TTRR has 2 transmitter on ch 51/53 and 2 receiver on ch. 55/57 (it works with MFL-RRTT)*

## Main features:

- **CWDM LASERS** to fit many RF channels over a single fiber
- **LOW NOISE DESIGN** to allow great coverage when used to remote receiving antennas
- **HIGH INTERFERENCE IMMUNITY** thanks to high IIP3 design and a control/compensation of gain
- **EASY TO USE** thanks to integrated RF/optical power meter and optical power compensation
- **DIGITALLY TUNABLE FILTERS** 25 MHz bandwidth, center frequency tunable over 404-788 MHz (optional)
- **INTEGRATED FAILSAFE REDUNDANCY**: It can route RF through an external filter or to additional receiver (redundancy) to easily implement a failsafe configuration that can switch on a redundant receiver or transmitter if any fault is detected
- **IFB MODE**: It can route an IFB high power signal to transmit locally and send IFB carrier over fiber to slave units. When it is working along with a MTK952MS in slave configuration, the fiber loss is automatically recovered and the unit increases the gain so that the transmitter power equals the target level (measured with an power/SWR meter integrated into the MTK952MS)
- **REMOTE MONITOR/CONTROL**: thanks to a data link on Ethernet 10/100 Base Tx
- **REDUNDANT AC / DC POWER SUPPLY**:
  - AC: 90V-264V~, 47-63 Hz, 2A fused, max 60 Watts
  - DC: 10-28Vdc (max 5A), [XLR-4M] VDC-pin 4 / GND-pin 1 / NC-pin 2 / NC-pin 3

*NOTE: if both AC/DC power are supplied, the device uses only AC power supply*
- **RF INPUT/OUTPUT**:
  - 4 N connector female 50Ω with switchable 12V boosting power (only on transmitter modules)
  - 2 BNC-F 50Ω each *optical transmitter module*, failsafe option or external RF filter
  - 1 BNC-F 50Ω each *optical receiver module*, failsafe option
- **OPTICAL INPUT/OUTPUT**: 5 connectors SC-APC type
- **DATA LINK**: Ethernet on RJ45 10/100 Base TX

## SAFETY INSTRUCTION

- Read this safety instruction and the manual first
- Follow all instructions and information.
- Do not lose this manual.
- Do not use this apparatus under the rain or near the water.
- Do not install the apparatus near heaters or in hot environments, do not use outside the operating temperature range.
- Mount the apparatus as indicated in the instruction, do not block side grids for air ventilation
- **ATTENTION:** supply the apparatus with a correct mains voltage and with the ground connection. Check the power cord integrity.
- The power cord must be protected from damage
- Do not install the apparatus near heaters or in hot environments, do not use outside the operating temperature range.
- Do not open the apparatus, only qualified service technician are enabled to operate on it. The apparatus needs servicing when it is not properly working or is damaged by liquids, moisture or other objects are fallen inside the apparatus.
- Use only accessories or replacement parts authorized or specified by the manufacturer.
- Clean the apparatus only with dry cloths, do not use liquids.
- The ON/OFF is a double pole circuit breaker, but to ensure the complete disconnection of the apparatus, disconnect the power cord.
- Report the serial number and the purchasing date in front of the manual. It is needed to have proper replacement parts or accessories from the manufacturer.
- When replacement parts are needed, use only replacement parts authorized from the manufacturer. Substitution with not authorized parts could result in electric shock, hazards or fire.
- Keep attention on all the labels with warnings or hazards on the apparatus.

### Optical Safety!!!



Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007

Wisecom MFL contains laser diode sources operating at 1460 to 1620 nm.

These devices are rated at under IEC 60825-1:2007 as CLASS 1M LASER PRODUCT

Never look into the end of an optical fibre directly or by reflection either with the naked eye or through an optical instrument. Never leave equipment with radiating bare fibres accessible – always cap the connectors.

Do not remove equipment covers when operating.

Adjustment, maintenance and repair of the equipment should only be carried out by suitably qualified personnel.

This product is supplied with angle-polished connectors and these must not be confused with standard flat, spherical or "super" polished connectors. These connector types are not interchangeable and mating one with the other will damage both the cable and the equipment.

The specification of the optical connector is critical to the performance of the complete fibre optic link. System performance can only be guaranteed with fibre optic cables and connectors supplied by Wisecom.

## FRONT PANEL CONTROL AND FUNCTIONS

MFL allows an easy and quick configuration using buttons, push knobs and display.



The front panel is functionally divided in the following section:

### A - LINK STATUS



Transmitter / Receiver configurations

### 1 Connection status:

- The first column of LEDs indicate Alarms
- The ON column indicate if a module is ON
- The FAILSAFE column indicate if the Failsafe option is enabled
- STATUS and CONN, showing the LED indications of the Ethernet module on the rear panel

### 2 Display (64 x 256 pixels yellow OLED display)

3 3 push buttons (membrane). The function of each button (upper, middle and lower) will be readable from the contextual menu on the display.

### 4 Warning (YELLOW) and Alarm (RED) light indicator

### 5 Push rotary knob. Rotate and push to select.

### B - LINK DIAGRAM

This part shows the block diagram of one complete channel and the BOOSTER supply if enabled from the transmitters

### C - TEMPERATURE ALARMS & CONFIGURATION LABEL

**TEMP. ALARM:** indicate eventually high temperature on the device.

**FAN1/FAN2:** these LEDs turn on if faults occur to the cooling system.

**CONFIGURATION LABEL:** name and configuration of the device.

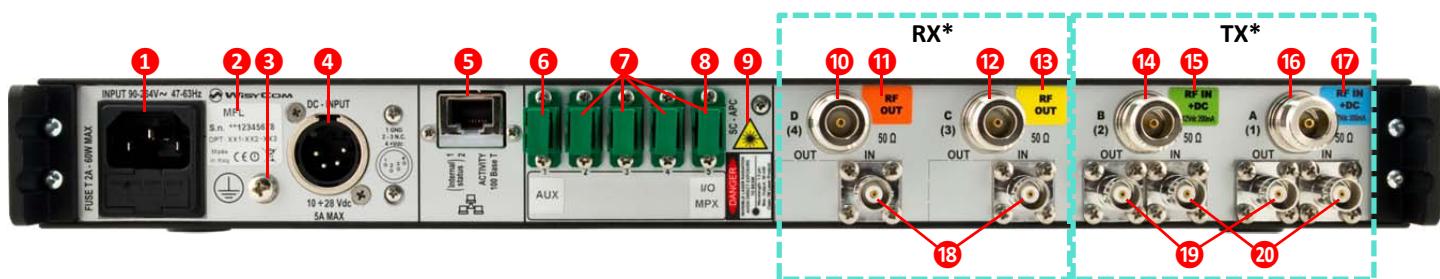
### D - LOCK & POWER

**LOCK:** it locks the editing of the display.

**POWER:** ON/OFF square powering button turns on/off the MFL. Above the power button, there are two LEDs to indicate the type of power supply.

*NOTE: If both AC/DC power are supplied, both LEDs turn on but the device uses only AC power supply*

## REAR PANEL



- ① **AC Power Plug** AC mains power input, IEC Connector 90-264 Vac
- ② **Product label** with Serial Number and Options installed
- ③ **Ground point** To connect the MFL rack frame to ground
- ④ **DC Power Plug (only with MFL-DC option)** DC power input, 10-28Vdc, Max 5A
- ⑤ **Ethernet socket (RJ45)** for connection to a network or computer
- ⑥ **Auxiliary optical Input/Output Connector**
- ⑦ **Optical Input/Output Connectors** where the optical signals are divided by wavelength
- ⑧ **Optical Input/Output Connector** where the optical signals are multiplexed (**only with MFL-DMX option**)
- ⑨ **Optical safety label**
- ⑩ **Output N connector female 50Ω (\*)**
- ⑪ **Orange label:** relative laser wavelength = 1570 nm
- ⑫ **Output N connector female 50Ω (\*)**
- ⑬ **Yellow label:** relative laser wavelength = 1550 nm
- ⑭ **Input N connector female 50Ω** with switchable 12V boosting power (**only on transmitter modules**) (\*)
- ⑮ **Green label:** relative laser wavelength = 1530 nm
- ⑯ **Input N connector female 50Ω** with switchable 12V boosting power (**only on transmitter modules**) (\*)
- ⑰ **Blue label:** relative laser wavelength = 1510 nm
- ⑱ **BNC-F connector 50Ω** for failsafe option (**on receivers modules**) (\*)
- ⑲ **BNC-F connector 50Ω** to connect the output of an external filter (**on transmitters modules**) (\*)
- ⑳ **BNC-F connector 50Ω** to connect the input of an external filter or for failsafe option (**on transmitters modules**) (\*)

\* In this example. Other configurations on request.

## SISTEM OVERVIEW

The system is composed by a MFL-BASE (1U rack frame) and some optional/modular boards to build the desired configuration. MFL-BASE can have up to 4 optical modules that can be either TX or RX (factory installed) to adapt the unit to several configurations.

To simplify the usage we give a name of the final configuration that easy identify the CWDM channels and a color code for the RF connectors (N type).

We use as default 4 laser wavelength although the CWDM standard can allow to use much more with a 20nm wavelength separation:

- Channel 51 short name for wavelength 1510 nm
- Channel 53 short name for wavelength 1530 nm
- Channel 55 short name for wavelength 1550 nm
- Channel 57 short name for wavelength 1570 nm

*Wavelength and Color Coding:*

Channel	Wavelength	Color Identifier
51	Wavelength 1510 nm laser, single mode	Blue
53	Wavelength 1530 nm laser, single mode	Green
55	Wavelength 1550 nm laser, single mode	Yellow
57	Wavelength 1570 nm laser, single mode	Orange

For example:

- MFL-TTRR has 2 Tx on ch.51/53 and 2 Rx on ch 55/57
- MFL-RRTT has 2 Rx on ch.51/53 & and 2 Tx on ch 55/57
- MFL-TT\*\* has 2 Tx on ch.51/53 and no module on ch 55/57
- MFL-RR\*\* has 2 Rx on ch.51/53 and no module on ch 55/57

NAME (i.e.)	Ch. 51	Ch. 53	Ch. 55	Ch. 57
MFL-TTRR	T	T	R	R
MFL-RRTT	R	R	T	T
MFL-TT**	T	T	-	-
MFL-RR**	R	R	-	-

Following the main code and option that can build up a MFL system:

#	Code	Description
1	MFL-BASE	WIDEBAND RF OVER FIBER MAINBOARD 19' 1U Rack units , aluminium frame Oled display - Ethernet - failsafe switch - realtime clock AC Powered 230V
2	MFL-RX	Optical RX module for MFL (CWDM)
3	MFL-TX	Laser TX module for MFL (CWDM)
4	MFL-DC	Insulated DC power with battery monitor (10÷28Vdc)
<b>Optional</b>	MFL-DMX	Module Mux/Demux for 1:4 CWDM
	MFL-BF1	RF filter 25MHz tuning range over 404÷788 MHz

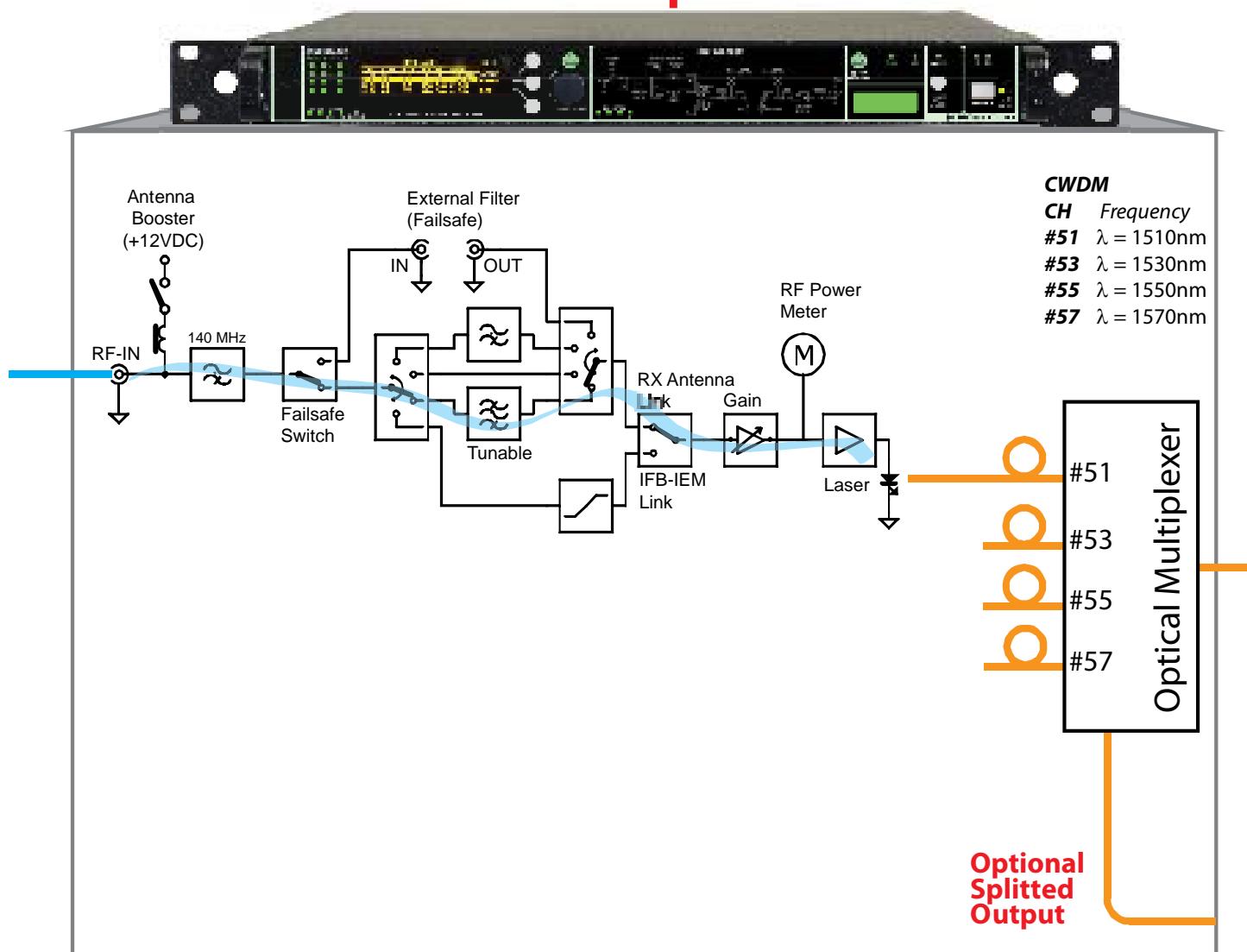


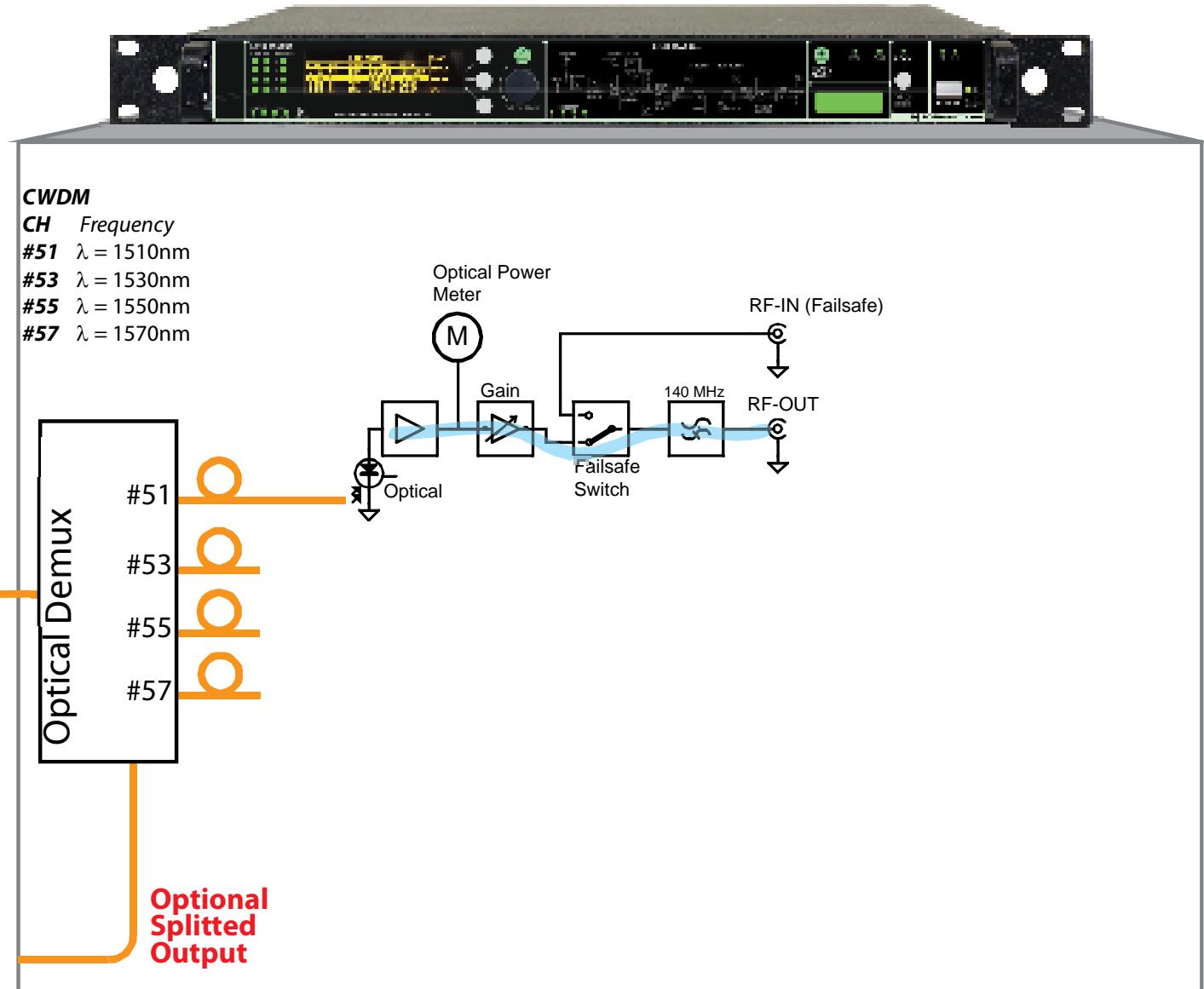
Max 4 modules  
(between TX and RX)

\* The images are purely for information. This represent one of the possible configurations

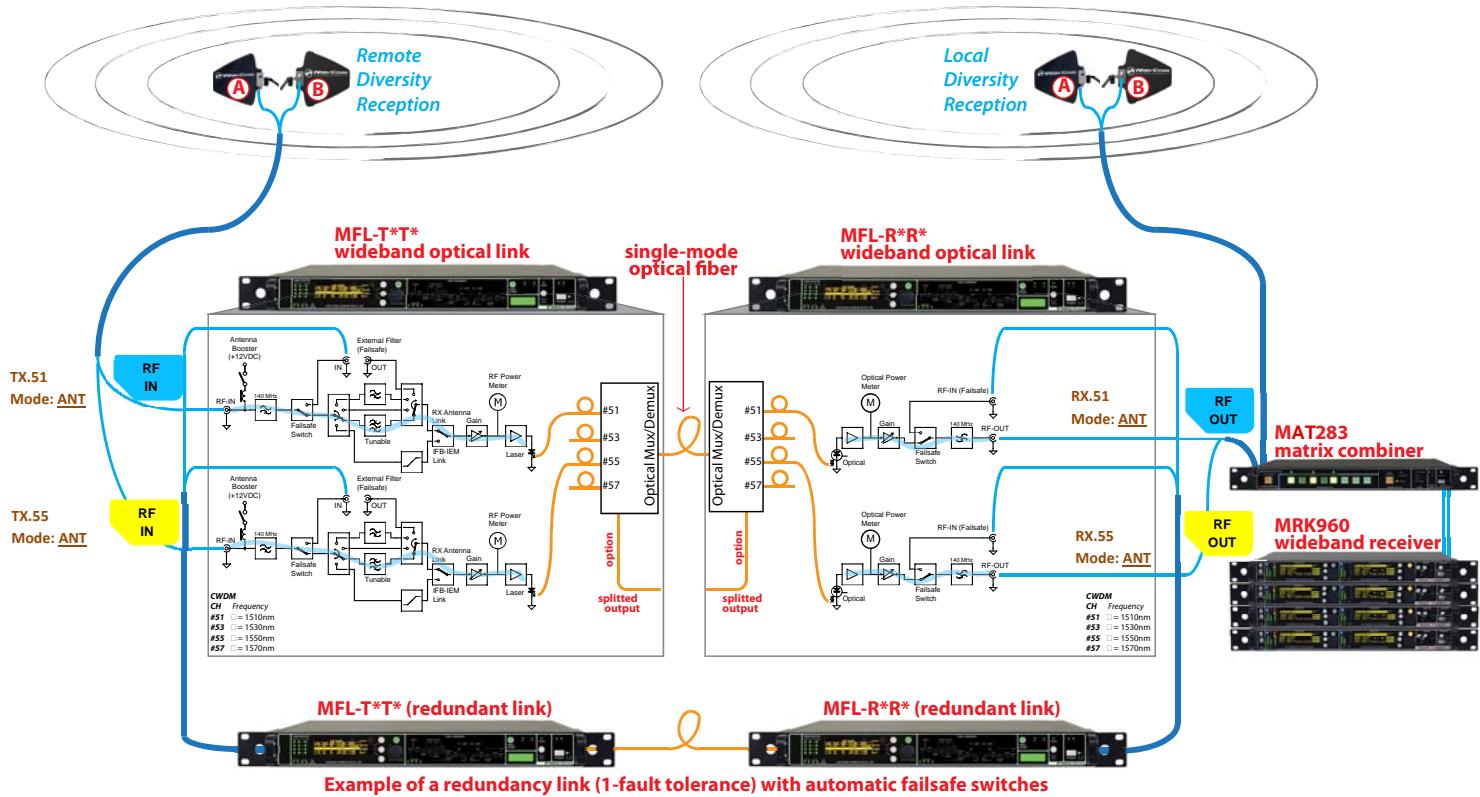
**SYSTEM DESCRIPTION: TRANSMITTER MODE**

# MFL-T\*\*\* wideband optical link



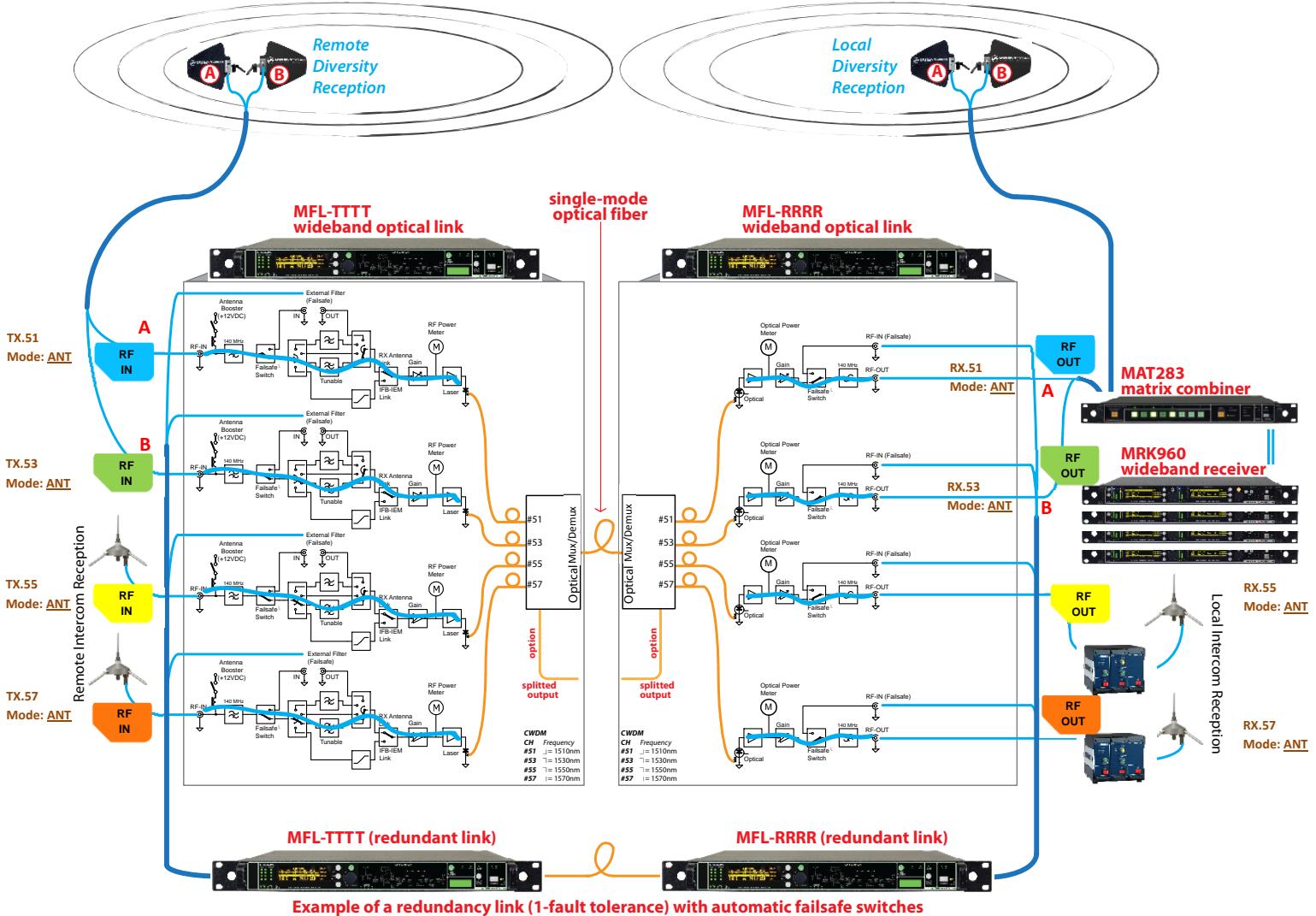
**SYSTEM DESCRIPTION: RECEIVER MODE****MFL-R\*\*\*  
wideband optical link**

## CONFIGURATION EXAMPLE: REMOTE DIVERSITY WITH DOUBLE FAILSAFE REDUNDANCY



Above an example of remote diversity reception with MFL-T\*T\* in the remote site and MFL-R\*R\* in local site (i.e. OB van or main studio facility). RF signal on remote site are received by a couple of antennas (MFL can provide booster power if needed). The signal is filtered using the internal wide-band tunable filter (25 MHz over 400-800 switching-bandwidth), optimized with a gain control and modulated using the LASERS. Thanks to CWDM (Coarse Wavelength Division Multiplexing) technology all optical signals are combined in a single fiber. In this way we can optimize the fiber but also it makes very easy to have a system totally redundant. Failsafe switches (both in MFL-T\*T\* and MFL-R\*R\*) allow RF re-routing if a fault happens (i.e. no power supply, no RF power or no optical power). All RF and optical signals are then re-routed on the redundant links automatically (in this case a redundant fiber and 2 redundant MFLs)!

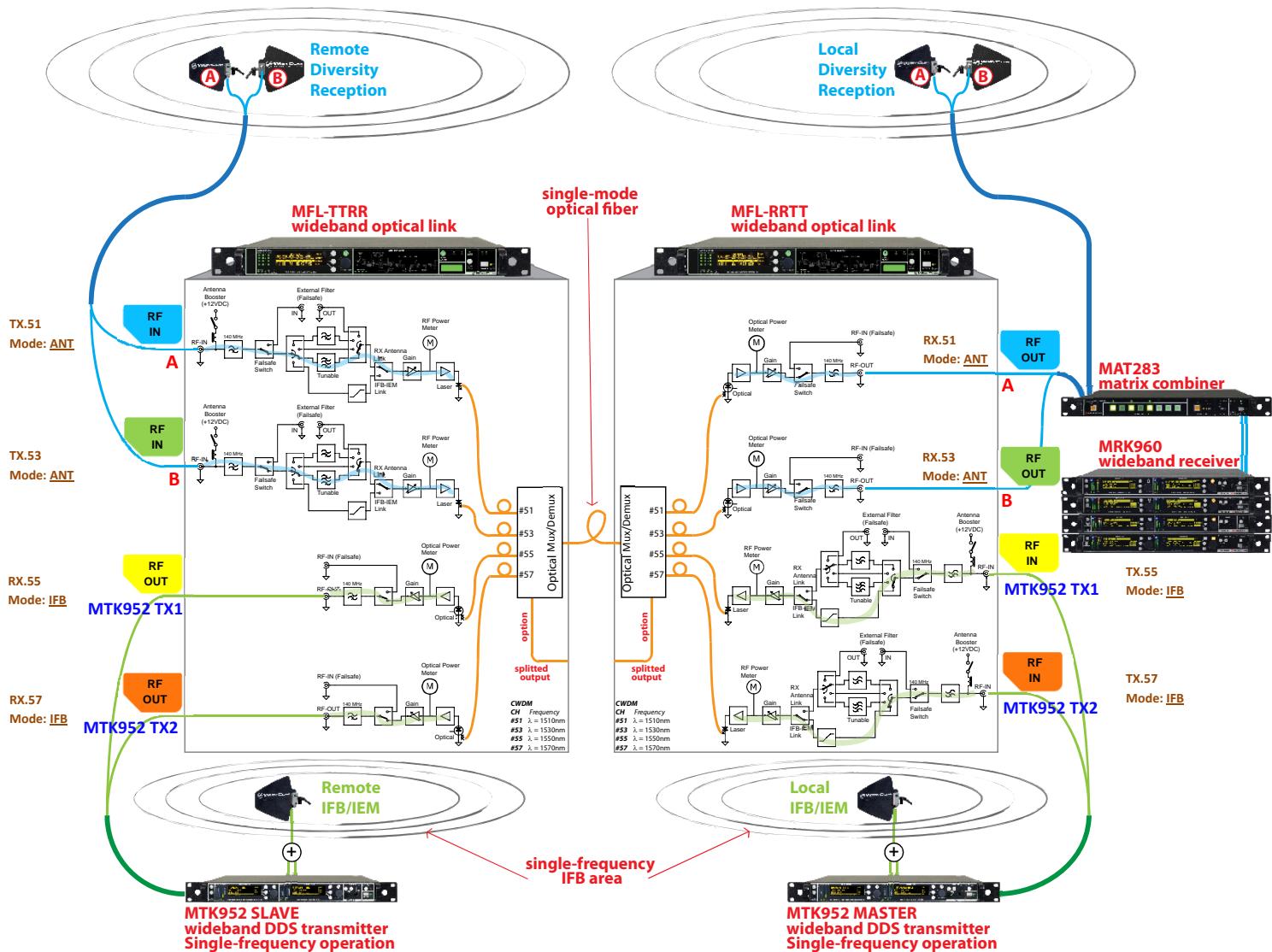
## CONFIGURATION EXAMPLE: REMOTE DIVERSITY AND IFB AREA WITH DOUBLE FAILSAFE REDUNDANCY



Above an example of remote diversity reception using all of 4 plug-in modules available: MFL-TTTT in the remote site and MFL-RRRR in local site (i.e. OB van or main studio facility).

In this example a remote reception for Microphones and Intercoms: one single mode fiber carries 4 RF channels and another one provides 1-fault tolerance on all active parts if needed!

## CONFIGURATION EXAMPLE: REMOTE DIVERSITY AND IFB AREA



Above an example of remote diversity reception using all of 4 plug-in modules available:

- MFL-RRTT in the remote site and MFL-TTRR in local site (i.e. OB van or main studio facility).

The remote antenna reception mode is similar to the one already described before. Again the tunable filter and variable gain allow a complete power control, in this way fiber always works at best condition without any risk of saturation!

All RF and optical power can be remotely monitored through Ethernet but also can be recorded with the real -time clock for later check!

Using MAT283 matrix combiner the remote and the local area can be integrate in a very safe way: areas which are not needed or noisy can be disabled in real time!

Simply setting up the MFL mode from "ANT" (antenna) to "IFB", it commutes on an internal RF path designed to best modulate a reference IFB signals. On local site a MTK952MS in master configuration generates an IFB signal and a reference out that feeds the optical transmitter (in mode "IFB").

On the remote site, the reference signal is received and amplified through a MTK952MS in slave configuration:  
This way we can create a single-frequency IFB area!

The system is able to compensate optical and RF power:

- MFL monitors (through an optical power meter) and compensates automatically the loss of fiber!
- MTK952 monitors the transmitted level (with an internal power/SWR meter) to reach desired output power!

## OLED DISPLAY

### MFL Info screen

Switch on the MFL and by pushing the rotary knob (at the right of the display) all the basic information are displayed:

- 1 Product name
- 2 Serial number
- 3 Class and Hardware version
- 4 Firmware version
- 5 Application Firmware version

<b>WISYCOM</b>
Product name: MFL
Serial number: T3422043
Class/HW rev: 01/00
Fw ver: 1.1
App Fw ver: 1.9.d - BL: 1.0.d

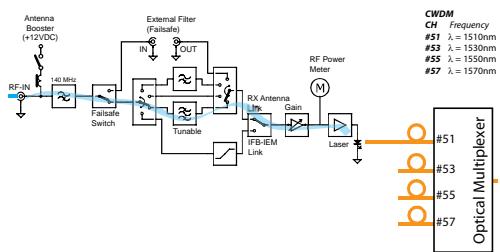
Push the rotary knob to enter the Main screen

### Main screen

NAME	2014 May 14 16:33
LINK	Φ
1 TX.51	ON
2 TX.53	ON
3 RX.55	ON
4 RX.57	ON
MODE	
ANT	
IFB	
ANT	
ANT	
FILTER	
470-840	
CUR/PWR	MAIN
27.40 mA	
150-840	
27.20 mA	SELECT
150-840	
0.01 mW	
150-840	
0.00 mW	RF LEV

In the left top side of the main screen there is the "NAME" of the MFL that is settable in the [Main menu](#). At the right of "NAME", date and time are displayed.

- **LINK** The first number (1 to 4) identify the link (same reference on back-side connectors).  
TX or Rx if that link has a laser transmitter or a receiver, respectively.  
The last number after the dot, 51/53/55/57 refers to the CWDM link frequency: 1510/1530/1550/1570nm.
- **Φ** ON/OFF status of specific link
- **MODE** There are 2 possible modes:
  - ANT as remote antenna link
  - IFB as remote intercom link optimized on a 0dBm reference input
- **FILTER**



If the link is a transmitter (i.e. 1 TX.51) then there are 4 possible configurations:

1. 150-840 → to select a fixed 150-840 MHz band-pass filter

MFL - TTTR 2014 May 15 11.58			
LINK	Φ	MODE	FILTER GAIN
1 TX.51	ON	150-840	0.0 dB
2 TX.53	ON	150-840	0.0 dB
3 RX.55	ON	150-840	0.0 dB
4 RX.57	ON	150-840	0.0 dB

2. 470-840 → to select a fixed 470-840 MHz band-pass filter

MFL - TTTR 2014 May 15 11.59			
LINK	Φ	MODE	FILTER GAIN
1 TX.51	ON	470-840	0.0 dB
2 TX.53	ON	150-840	0.0 dB
3 RX.55	ON	150-840	0.0 dB
4 RX.57	ON	150-840	0.0 dB

3. BPF → to select the tunable filter, the number within brackets shows the center frequency on a 25 MHz bandwidth

MFL - TTTR 2014 May 15 11.57			
LINK	Φ	MODE	FILTER GAIN
1 TX.51	ON	BPF [404]	0.0 dB
2 TX.53	ON	150-840	0.0 dB
3 RX.55	ON	150-840	0.0 dB
4 RX.57	ON	150-840	0.0 dB

MFL - TTTR 2014 May 15 11.56			
LINK	Φ	MODE	FILTER GAIN
1 TX.51			1.0 dB
2 TX.53		Center freq [MHz]	1.0 dB
3 RX.55		404 [392-417]	1.0 dB
4 RX.57			1.0 dB

4. EXTERN → to select an external filter (between IN and OUT BNC connectors)

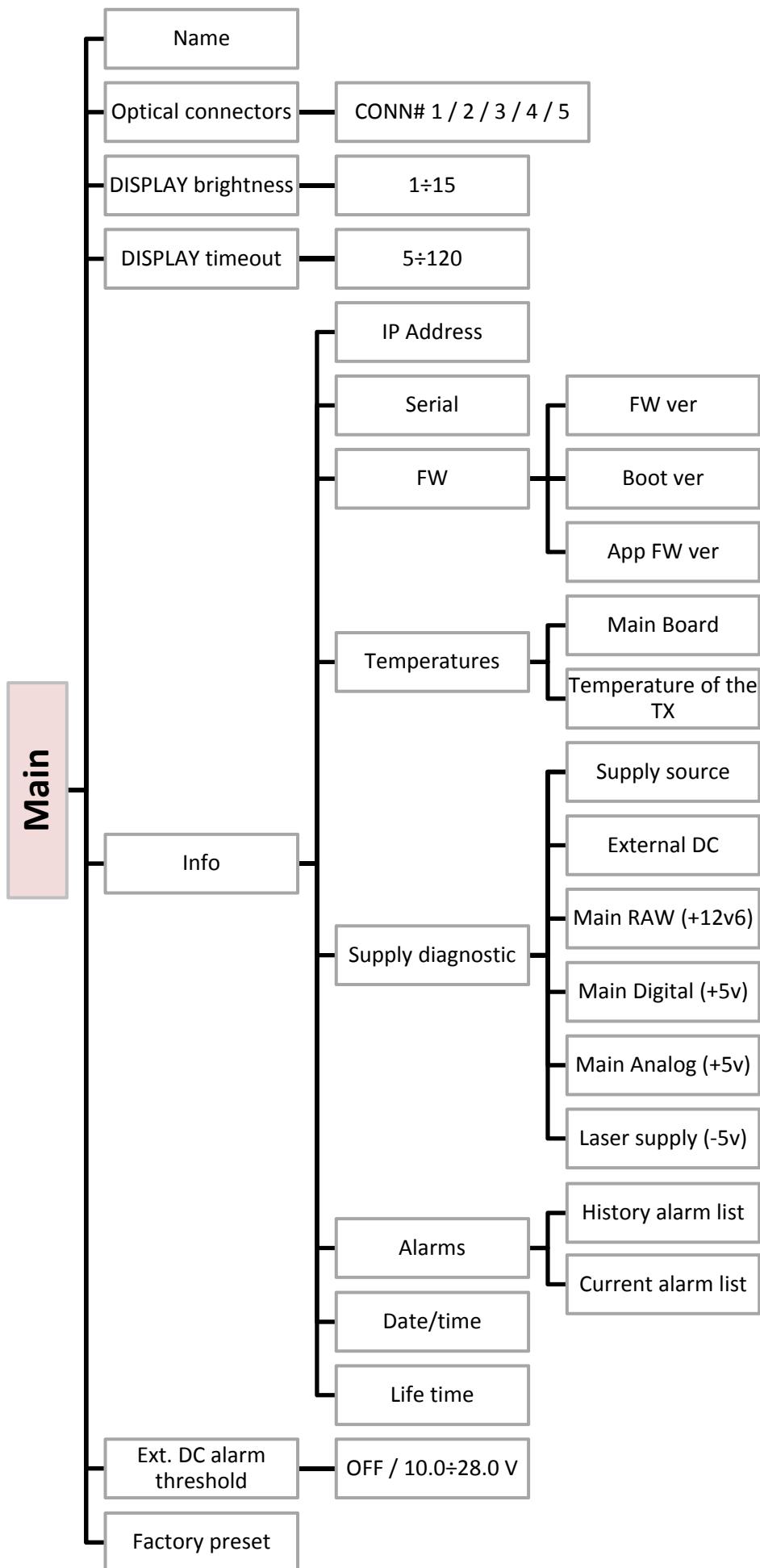
MFL - TTTR 2014 May 15 11.59			
LINK	Φ	MODE	FILTER GAIN
1 TX.51	ON	EXTERN	0.0 dB
2 TX.53	ON	150-840	0.0 dB
3 RX.55	ON	150-840	0.0 dB
4 RX.57	ON	150-840	0.0 dB

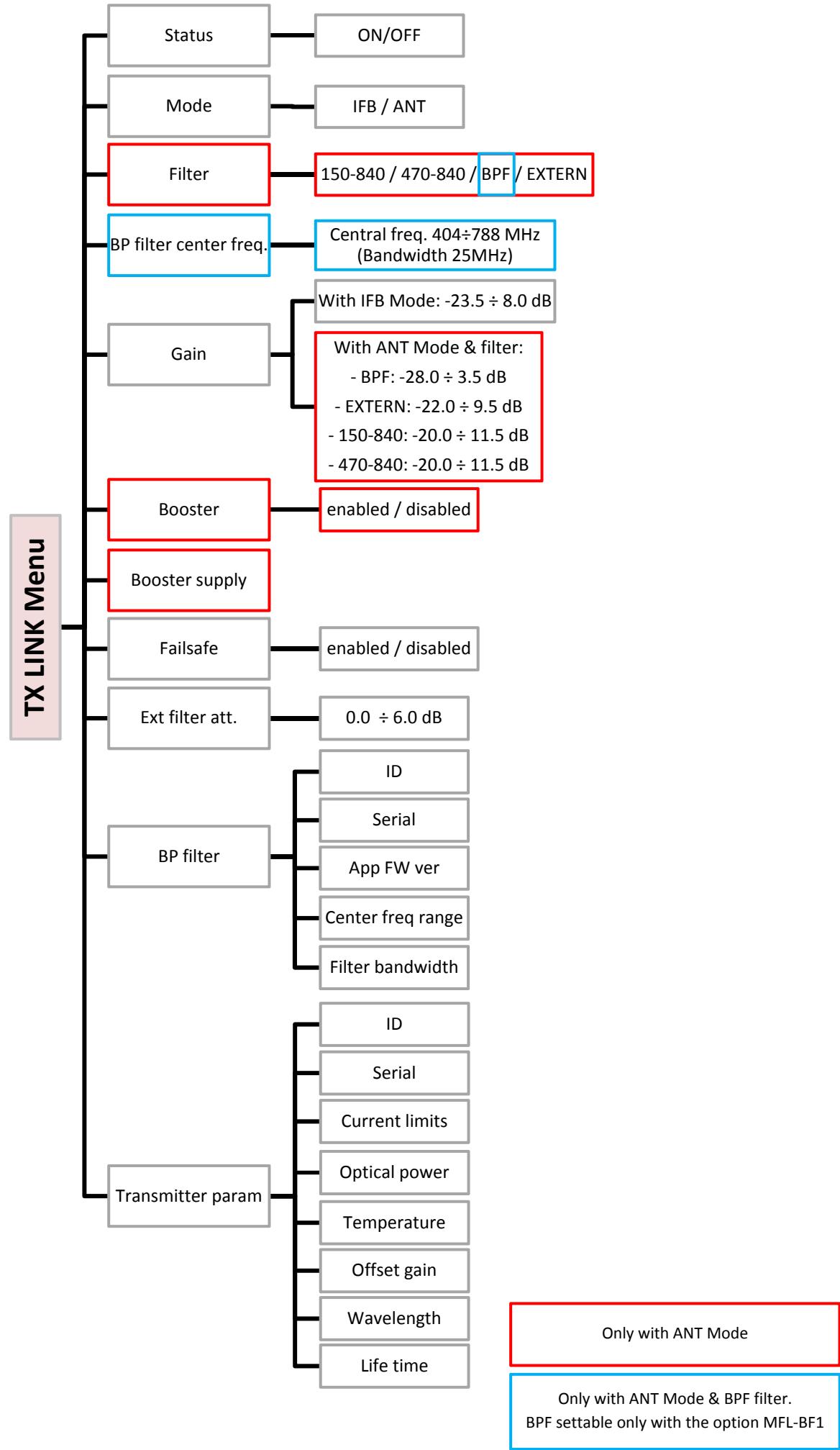
- **CUR/PWR**, **RF LEV** or **GAIN** → Pushing on lower right button the last column shows:

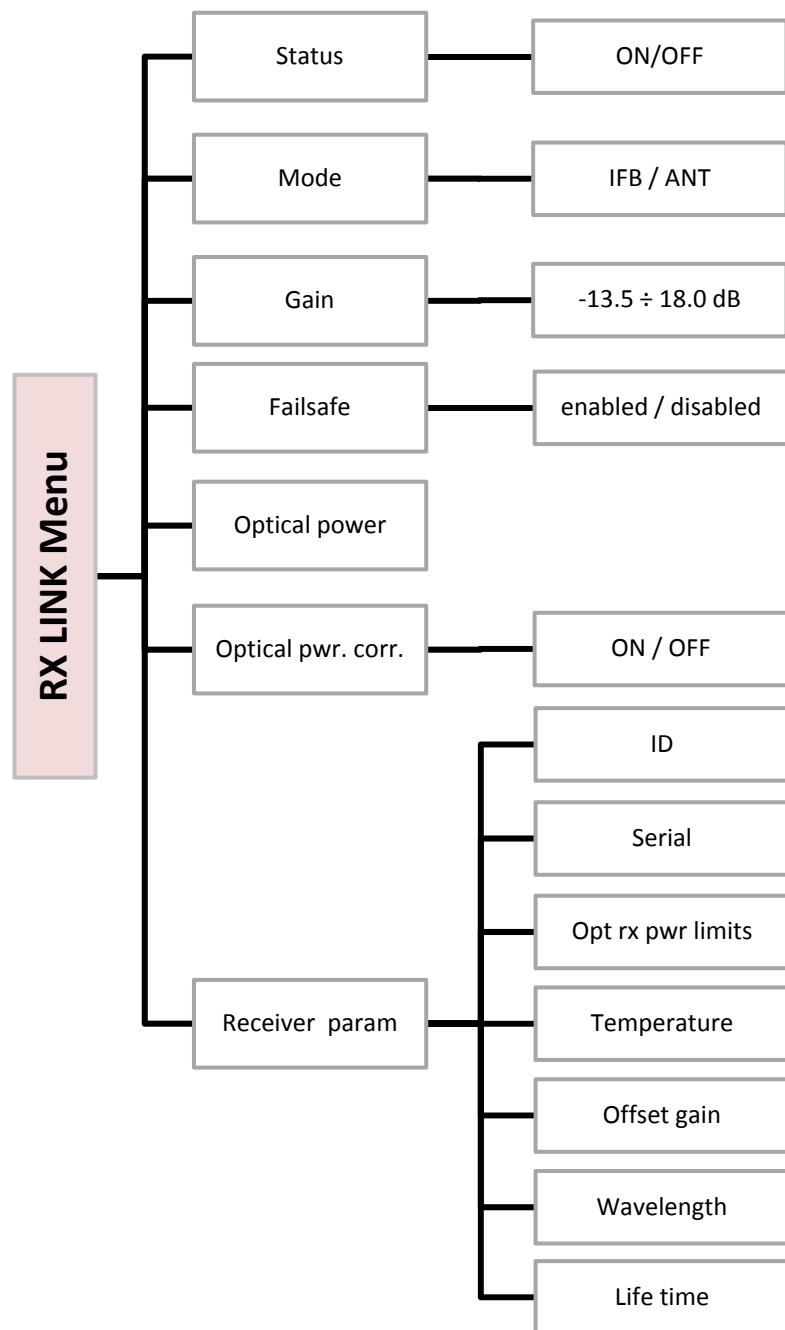
- CUR/PWR show the RF/optical power in reception or the laser current in TX module
- RF LEV shows the value of the RF power level
- "GAIN" that is the relative gain of the link. Here it is possible to change the gain in the operating range.

**NOTE:** unless you have special needs we recommend to keep GAIN to 0 dB and enable the optical power correction on the receiver side, since this is already optimized for most applications!

## Menu Tree

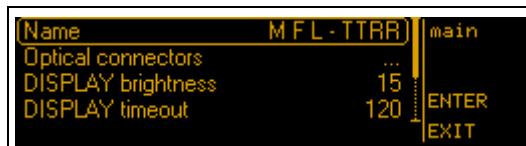
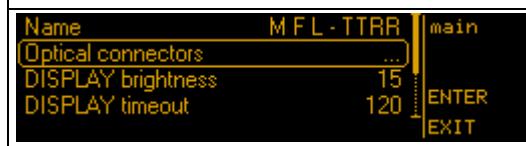
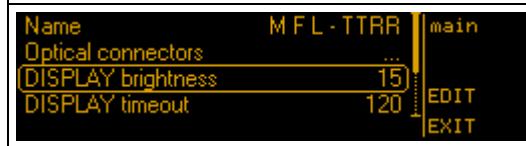
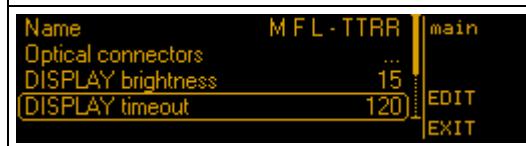
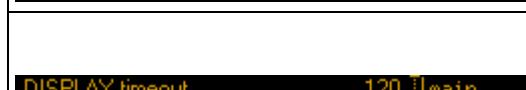






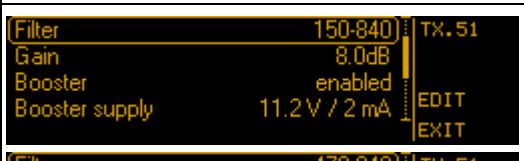
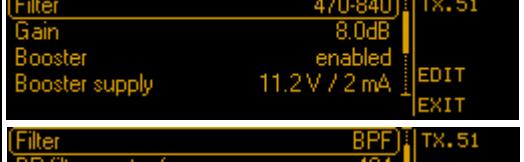
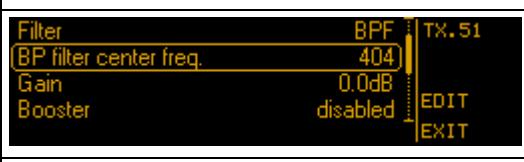
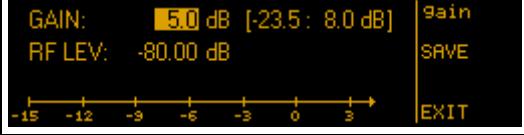
## Main menu

From the [Main screen](#), pushing the upper right button, it's possible to enter on the main menu options:

	<b>Name:</b> to change the name of the MFL shown in the Main screen. 12 alphanumeric characters (A-Z, a-z, 0-9, case-sensitive)																																												
 	<b>Optical connectors:</b> parameter that show the configuration and the optical attenuation of the 5 optical connectors																																												
	<b>DISPLAY brightness:</b> To set the brightness of the OLED display. 0÷15 step 1 (default 0)																																												
	<b>DISPLAY timeout:</b> to set the display timeout before decrease the brightness of the OLED display and before returning to Main screen. (default 30 seconds)																																												
 	<b>Info:</b> here it's possible to enter in the info menu and see the following information: <table border="1" data-bbox="595 909 1508 1583"> <thead> <tr> <th colspan="2"></th> <th style="background-color: #d9e1f2;">Example</th> </tr> </thead> <tbody> <tr> <td>IP address</td> <td>IP address of the device</td> <td>192.168.1.10.240</td> </tr> <tr> <td>Serial</td> <td>The serial number composed by 1 letter + 7 numbers</td> <td>T3427043</td> </tr> <tr> <td rowspan="3">FW</td> <td>FW ver</td> <td>Firmware version</td> </tr> <tr> <td>Boot ver</td> <td>Bootloader version</td> </tr> <tr> <td>App FW ver</td> <td>Application version</td> </tr> <tr> <td rowspan="2">Temperature</td> <td>Main Board</td> <td>Main board temperature</td> </tr> <tr> <td>x TX.5x</td> <td>Transmitter module temper.</td> </tr> <tr> <td rowspan="5">Supply diagnostic</td> <td>Supply source</td> <td>Type of power supply (AC/DC)</td> </tr> <tr> <td>External DC</td> <td>DC voltage supply</td> </tr> <tr> <td>Main RAW (+12v6)</td> <td>Main RAW voltage measured</td> </tr> <tr> <td>Main Digital (+5v)</td> <td>Main Digital voltage measured</td> </tr> <tr> <td>Main Analog (+5v)</td> <td>Main Analog voltage measured</td> </tr> <tr> <td rowspan="4">Alarms</td> <td>Laser supply (-5v)</td> <td>Laser voltage supply</td> </tr> <tr> <td>Current alarm list (ENTER)</td> <td>Number and type of alarms for the general apparatus and for each module</td> </tr> <tr> <td>History alarm list (HIST)</td> <td>Alarms memory</td> </tr> <tr> <td>Date/time</td> <td>Date and time</td> </tr> <tr> <td>Life time</td> <td>Life time of the device</td> <td>3d - 00h - 01m</td> </tr> </tbody> </table>			Example	IP address	IP address of the device	192.168.1.10.240	Serial	The serial number composed by 1 letter + 7 numbers	T3427043	FW	FW ver	Firmware version	Boot ver	Bootloader version	App FW ver	Application version	Temperature	Main Board	Main board temperature	x TX.5x	Transmitter module temper.	Supply diagnostic	Supply source	Type of power supply (AC/DC)	External DC	DC voltage supply	Main RAW (+12v6)	Main RAW voltage measured	Main Digital (+5v)	Main Digital voltage measured	Main Analog (+5v)	Main Analog voltage measured	Alarms	Laser supply (-5v)	Laser voltage supply	Current alarm list (ENTER)	Number and type of alarms for the general apparatus and for each module	History alarm list (HIST)	Alarms memory	Date/time	Date and time	Life time	Life time of the device	3d - 00h - 01m
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Life time	Life time of the device	3d - 00h - 01m																																											
 	<b>Ext. DC alarm threshold:</b> This menu item allows to enable and set a threshold for the alarm of low external DC power supply. If it is enabled, the threshold can be set from 10.0V to 28.0V with 0.1V step. (default OFF)																																												
 	<b>Factory preset:</b> with this option it's possible to reset the MFL to make the factory preset. The main parameters that are reseted by this function are: <ul style="list-style-type: none"> <li>- Display brightness: 0</li> <li>- Display timeout: 30 seconds</li> <li>- Ext. DC alarm threshold: OFF</li> </ul> The link parameters that are reset by this function are: <ul style="list-style-type: none"> <li>- Status: ON</li> <li>- Mode: ANT</li> <li>- Gain: 0.0dB</li> <li>- Failsafe: disabled</li> <li>- For TX Links: - Filter: 470-840           <ul style="list-style-type: none"> <li>- Booster: disable</li> <li>- Ext filter att.: 2.0dB</li> </ul> </li> <li>- For RX Links: - Optical pwr. corr.: ON</li> </ul>																																												

## TX Link menu

From the [Main screen](#), pushing the rotary knob, it's possible to enter on the selection screen and then, pushing the upper right button on the desiderate transmitter module, it's possible to enter on the TX Link menu:

	<b>Status:</b> status of the transmitter (default ON)
	<b>Mode:</b> working mode selection: <ul style="list-style-type: none"> <li>- ANT for remote antenna reception</li> <li>- IFB for remote intercom for iso-frequency areas</li> </ul>
	<b>NOTE:</b> set the transmitter module and the receiver module with the same working mode (as in the <a href="#">third configuration example</a> ) (default ANT mode)
	
	<b>Filter:</b> Type of RF filter ( <b>only for ANT mode</b> ) There are 4 possible configurations: <ul style="list-style-type: none"> <li>- 150-840: to have a fixed 150-840 MHz band-pass filter</li> <li>- 470-840: to have a fixed 470-840 MHz band-pass filter</li> <li>- BPF: tunable Band-Pass Filter (<b>only with MFL-BF1 option</b>)</li> <li>- EXTERN: to connect an external RF filter between IN and OUT BNC connectors</li> </ul> (default 470-840)
	
	<b>BP filter center freq:</b> allows to set the center frequency of the 25MHz Band Pass filter. It is selectable only if the optional tunable BP filter (opt: MFL-BF1) is mounted and the Filter selection is set to the tunable Band-Pass Filter (BPF). Allowed range: center frequency 404÷788, 1MHz step.
 GAIN: 5.0 dB [-23.5 : 8.0 dB]      Gain RF LEV: -80.00 dB      SAVE 	<b>Gain:</b> Settable gain with step of 0.5dB. With <u>IFB Mode</u> : -23.5 ÷ 8.0 dB (typ.) With <u>ANT Mode &amp; filter</u> : - <u>150-840</u> : -20.0 ÷ 11.5 dB (typ.) - <u>470-840</u> : -20.0 ÷ 11.5 dB (typ.) - <u>BPF</u> : -28.0 ÷ 3.5 dB (typ.) - <u>EXTERN</u> : -22.0 ÷ 9.5 dB (typ.) (default 0.0dB)
	<b>Booster:</b> To enable or disable the 12V boosting power ( <b>only for TX module in ANT mode</b> ) (default disabled)
	<b>Booster supply:</b> shows the voltage and current on the output connector, supplied with the booster option ( <b>only for TX module in ANT mode &amp; Booster set to enabled</b> )
	<b>Failsafe:</b> To enable or disable the Failsafe option (default disabled)

Booster	only ANT mode	TX.51
Booster supply	-	
Failsafe	enabled	
Ext filter att.	2.0 dB	EDIT EXIT

**Ext filter att.:** Attenuation of the external filter, that can be set by user from 0.0 to 6.0dB with step of 0.5dB.  
(default 2.0dB)

Booster supply	-	TX.51
Failsafe	enabled	
Ext filter att.	2.0 dB	ENTER EXIT
BP filter	...	

**BF filter:** here it's possible to see all the Band-Pass filter information:

ID	ID of the RF filter	Example
Serial	Serial number of the RF filter	TBF01
App FW ver.	Application firmware version of the RF filter	T1541322
Center freq. range	Center frequency range of the RF filter	1.0
Filter bandwidth	Filter bandwidth	404 - 788 MHz

Failsafe	enabled	TX.51
Ext filter	2.0 dB	
BP filter	...	ENTER EXIT
Transmitter param	...	

**Transmitter param:** here it's possible to see all the transmitter parameters:

ID	ID of the transmitter	Example
Serial	Serial number of the transmitter	OTM001
Current limits	Laser current working range	T1845210
Optical power	Transmission optical power	10.0mA - 50.0mA
Temperature	Working temperature	2.0 mW
Offset gain	Offset gain correction	39°C
Wavelength	Optical wavelength	0.0 dB
Life time	Life time of the device	1510nm
		3 d - 00 h - 49 m

## RX Link menu

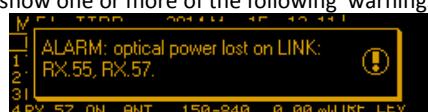
From the [Main screen](#), pushing the rotary knob, it's possible to enter on the selection screen and then, pushing the upper right button on the desiderate receiver module, it's possible to enter on the RX Link menu:

	<b>Status:</b> status of the transmitter (default ON)																								
	<b>Mode:</b> working mode selection: <ul style="list-style-type: none"> <li>- ANT for remote antenna reception</li> <li>- IFB for remote intercom in isofrequency areas applications</li> </ul> (default ANT mode)																								
	<b>Gain:</b> Settable gain from -13.5 to 18.0dB with step of 0.5dB. (typ.) (default 0.0dB)  <b>RF LEV:</b> LOW  																								
	<b>Failsafe:</b> To enable or disable the Failsafe option (default disabled)																								
	<b>Optical power:</b> This parameter show the received optical power																								
	<b>Optical pwr. corr.:</b> (optical power correction) this option can be enabled to ensure that, in case in changes of optical power, the overall gain of the system remains unchanged (to keep the gain in the RF output at 0dB). (default ON)																								
	<b>Receiver param:</b> here it's possible to see all the receiver parameters: <table border="1" data-bbox="595 1403 1516 1662"> <thead> <tr> <th colspan="3">Example</th> </tr> <tr> <th>ID</th> <th>ID of the receiver</th> <th>ORM001</th> </tr> </thead> <tbody> <tr> <td>Serial</td> <td>Serial number of the receiver</td> <td>T1841930</td> </tr> <tr> <td>Opt rx pwr limits</td> <td>Optical power working limits</td> <td>0.3mW – 3.0mW</td> </tr> <tr> <td>Temperature</td> <td>Working temperature</td> <td>NA</td> </tr> <tr> <td>Offset gain</td> <td>Offset gain of the module</td> <td>0.0 dB</td> </tr> <tr> <td>Wavelength</td> <td>Optical wavelength</td> <td>1550nm</td> </tr> <tr> <td>Life time</td> <td>Life time of the device</td> <td>3 d - 00 h - 49 m</td> </tr> </tbody> </table>	Example			ID	ID of the receiver	ORM001	Serial	Serial number of the receiver	T1841930	Opt rx pwr limits	Optical power working limits	0.3mW – 3.0mW	Temperature	Working temperature	NA	Offset gain	Offset gain of the module	0.0 dB	Wavelength	Optical wavelength	1550nm	Life time	Life time of the device	3 d - 00 h - 49 m
Example																									
ID	ID of the receiver	ORM001																							
Serial	Serial number of the receiver	T1841930																							
Opt rx pwr limits	Optical power working limits	0.3mW – 3.0mW																							
Temperature	Working temperature	NA																							
Offset gain	Offset gain of the module	0.0 dB																							
Wavelength	Optical wavelength	1550nm																							
Life time	Life time of the device	3 d - 00 h - 49 m																							

## Alarm List

When an alarm occurs, the MFL can show one or more of the following warnings:

- A. Show a message on the display



- B. Turn on the yellow or red alarm led



- C. Light up an auxiliary LED (in some cases)



- D. Insert the alarm on the current alarm list and in the "history" alarm list (in [MAIN>Info>Alarms menu](#))

- **Current alarm list:** pushing the rotary knob, it's possible to enter in the current alarm list where are displayed the number and type of current alarms in the general apparatus or in each module



- **History alarm list:** pushing the upper right button, it's possible to enter in the "history" alarm list where the alarm previously stored is displayed



The informations that are displayed in the history alarm screen are:

1	2	3	al. hist
Event: 001 / 100	CODE:21	T: open	
4 Optical power lost			
5 LINK: RX.51	2014 Apr 16 15:38:34	6	DEL ALL
7 Data: 0.00 mW			EXIT

1 Progressive number of the alarm

2 Alarm CODE

3 Type of alarm:

- open: when the alarm started
- close: when the alarm stopped

4 Alarm description

5 Where the alarm occurred

6 When the alarm occurred

7 Other informations

NOTE: with the center right button it's possible to delete all alarms in the history alarm list (DEL ALL)

The alarm can be related to a specific transmitter/receiver or general.  
Shown below the complete alarms list:

Name	Code	Message on display (A)	Alarm LED (B)	Auxiliary LED (C)	Alarm list (D)
E2_INVALID	0x06	Invalid int memory	FIXED RED	-	-
E2_INVALID_COPY1	0x80	Calibration data copy #1 invalid	FIXED YELLOW	-	Cal data copy1 invalid
E2_INVALID_COPY2	0x81	Calibration data copy #2 invalid	FIXED YELLOW	-	Cal data copy2 invalid
E2_CRC_DIFF	0x07	Calibration data copies differ	FIXED RED	-	-
E2_ERROR_UPDATE_CRC	0x08	Error updating calibration copy crc	FIXED RED	-	cal copy crc update error
HW_INIT_FAILED	0x09	System boot failed.	FIXED RED	-	-
NO_LINKS	0x0A	No links declared in calibration memory	FIXED RED	-	-
NO_LINKS_FOUND	0x0B	No links hw detected	FIXED RED	-	-
PWR_SUPPLY	0x0C	Power supplies failure	FIXED YELLOW	-	power supplies failure
TEMP	0x04	Internal high temperatur	-	"TEMP. ALARM" RED SLOWLY BLINKING	high temperature
I2C0	0x0D	Communication error on I2C bus #0	FIXED RED	-	I2C bus #0
I2C1	0x0E	Communication error on I2C bus #1	FIXED RED	-	I2C bus #1
FAN1	0x02	Fan #1 doesn't work properly	YELLOW SLOWLY BLINKING	FAN 1	fan #1
FAN2	0x03	Fan #2 doesn't work properly	YELLOW SLOWLY BLINKING	FAN 2	fan #2
TEMP_SENS	0x0F	Temperature sensor doesn't communicate	RED SLOWLY BLINKING	-	temperature sensor comm.
LOW_BATT	0x10	Backup battery low	RED SLOWLY BLINKING	-	backup battery low
LINK_NOT_FOUND	0x0B	HW not found	FIXED RED	*	HW not found
LINK_NOT_CONSISTENT	0x11	Link type doesn't match	FIXED RED	*	Link type match
LINK_LASER_E2_INVALID	0x12	Laser calibration data invalid	FIXED RED	*	Laser cal data invalid
LINK_LASER_E2_INVALID_COPY1	0x13	Laser calibration data copy 1 invalid	FIXED RED	*	Laser cal copy1 invalid
LINK_LASER_E2_INVALID_COPY2	0x14	Laser calibration data copy 2 invalid	FIXED RED	*	Laser cal copy2 invalid
LINK_LASER_E2_CRC_DIFF	0x15	Laser calibration crc mismatch	FIXED RED	*	Laser cal crc mismatch
LINK_LASER_E2_ERROR_UPDATE_CRC	0x16	Laser calibration crc update error	FIXED RED	*	Laser cal crc update
LINK_RF_FIL_NOT_FOUND	0x17	RF filter not found	FIXED RED	*	RF filter not found
LINK_RF_FIL_E2_INVALID	0x18	RF filter invalid calibration data	FIXED RED	*	RF filter invalid E2
LINK_RF_E2_INVALID_COPY1	0x19	RF filter calibration data copy #1 invalid	FIXED RED	*	RF fil cal copy #1 inval.
LINK_RF_E2_INVALID_COPY2	0x1A	RF filter calibration data copy #2 invalid	FIXED RED	*	RF fil cal copy #2 inval.
LINK_RF_FIL_E2_UNCAL	0x1B	RF filter not calibrated	FIXED RED	*	RF filter not calibrated
LINK_RF_FIL_E2_DIFF	0x1C	RF filter calibration copies differ	FIXED RED	*	RF fil cal copies differ
LINK_ON_OFF	0x20	On/Off procedure failure	FIXED RED	*	On/Off procedure failure
LINK_FAILSAFE_RX	0x1D	ALARM: optical power lost	YELLOW SLOWLY BLINKING	FAILSAFE FAST BLINKING + *	failsafe active
LINK_FAILSAFE_TX	0x1D	ALARM: laser current out of range	YELLOW SLOWLY BLINKING	FAILSAFE FAST BLINKING + *	failsafe active
LINK_BOOSTER	0x1E	ATTENTION: booster over current	YELLOW SLOWLY BLINKING	BOOSTER FAST BLINKING + *	booster overcurrent
LINK_LASER_EOL	0x1F	ATTENTION: laser life terminating	FIXED YELLOW	*	laser life terminating
LINK_TEMP_SENS	0x0F	Temperature sensor doesn't communicate	RED SLOWLY BLINKING	*	temperature sensor comm.

\* In the "ALARM" column in the front panel, appears a blinking red LED in correspondence at the link on which the alarm is being

## Troubleshooting

	Alarms	Alarm description	Troubleshooting
GENERAL ALARM	E2_INVALID	None of the two calibration copies of the internal E2 memory is valid	
	E2_INVALID_COPY1	Has not been validated the CRC of the copy #1 of the data of calibration of E2 memory	
	E2_INVALID_COPY2	Has not been validated the CRC of the copy #2 of the data of calibration of E2 memory	
	E2_CRC_DIFF	The two copies of the data in the internal E2 memory, have a valid CRC but different from each other	
	E2_ERROR_UPDATE_CRC	There was an error while updating the CRC of the calibration data in the internal E2 memory	
	HW_INIT_FAILED	There was an error during the initialization phase of the machine	
	NO_LINKS	In the internal E2 memory are not declared the Links (Rx or Tx) to manage	
	NO_LINKS_FOUND	The Links to manage are declared, but physically it was not possible to communicate with any module, so it is assumed that they haven't been installed	
	PWR_SUPPLY	Abnormalities were noted in the power supply of the machine.	
	TEMP	One of the temperature sensors measures a temperature > 60°C	- check if the two fans work properly (check alarms code 0x02 or 0x03 on the alarm list) - switch off the MFL for cooling and check the location temperature - clean the ventilation grids
LINK ALARM	I2C0	Error on I2C0 bus	
	I2C1	Error on I2C1 bus	
	FAN1	The fan on the left (#1) doesn't turn	- switch off and switch on the MFL
	FAN2	The fan on the right (#2) doesn't turn	- switch off and switch on the MFL
	TEMP_SENS	Communication error with the temperature sensor of the main board	
	LOW_BATT	This message informs that the backup battery is running low	
	LINK_NOT_FOUND	I-th link not found. The error is detected in the initialization phase when attempting to communicate with the E2 memory on the module to establish if the module is present or not. <i>Note: The link is not considered valid and therefore will not be present among those available</i>	
	LINK_NOT_CONSISTENT	I-th link of type different from that stated in the E2 memory. <i>Note: The link is not considered valid and therefore will not be usable</i>	
	LINK_LASER_E2_INVALID	The I-th link doesn't have a valid calibration memory (none of CRC of the two copies is correct). <i>Note: The link is not considered valid and therefore will not be present among those available</i>	
	LINK_LASER_E2_INVALID_COPY1	The copy #1 of the I-th link is not valid	
LINK ALARM	LINK_LASER_E2_INVALID_COPY2	The copy #2 of the I-th link is not valid	
	LINK_LASER_E2_CRC_DIFF	The CRC of the calibration data of the laser module are valid but different from each other. <i>Note: The link is not considered valid and therefore will not be present among those available</i>	
	LINK_LASER_E2_ERROR_UPDATE_CRC	There was an error while updating the CRC of the calibration data of the i-th laser module	
	LINK_RF_FIL_NOT_FOUND	Is declared the presence of the internal RF filter, but is failed the communication. <i>Note: The filter is considered not present, therefore the BPF filter is not present in the items of the transmitters menu (the other filters are available)</i>	
	LINK_RF_FIL_E2_INVALID	The internal RF filter has no valid calibration data <i>Note: The filter is considered not present, therefore the BPF filter is not present in the items of the transmitters menu (the other filters are available)</i>	
	LINK_RF_E2_INVALID_COPY1	The copy #1 of the calibration data of the RF filter is not valid	
	LINK_RF_E2_INVALID_COPY2	The copy #2 of the calibration data of the RF filter is not valid	
	LINK_RF_FIL_E2_UNCAL	The two copies of the internal RF filter are valid and the CRC equal to each other but there are no valid calibration data. <i>Note: The filter is considered not present, therefore the BPF filter is not present in the items of the transmitters menu (the other filters are available)</i>	
	LINK_RF_FIL_E2_DIFF	The two copies of the internal RF filter are valid but the CRC are different from each other <i>Note: The filter is considered not present, therefore the BPF filter is not present in the items of the transmitters menu (the other filters are available)</i>	

LINK__ON_OFF	There was an error in the phase of power ON/OFF of a link	
LINK__FAILSAFE_RX	This alarm appear when the Failsafe is activated in a receiver and the optical signal is lost	
LINK__FAILSAFE_TX	This alarm appear when the Failsafe is activated in a transmitter and the laser current goes out of range (the TX module doesn't work properly)	
LINK__BOOSTER	It was detected a malfunction in the power of the booster	
LINK__LASER_EOL	The laser has terminated its life time	
LINK__TEMP_SENS	It was detected a communication problem with the temperature sensor of the laser module	

If a problem not listed in the above table occurs or if the problem cannot solved with the proposed troubleshooting, please contact support service at [support@wisycom.com](mailto:support@wisycom.com) or [sales@wisycom.com](mailto:sales@wisycom.com).

## TECHNICAL SPECIFICATION

### Mainframe

<b>RF to Optical modules (TX module)</b>	:	1 to 4
<b>Optical to RF modules (RX module)</b>	:	1 to 4
<b>Maximum number of modules</b>	:	4
<b>RF to fiber link working modes</b>	:	2 ("ANT" mode or "IFB" mode)
<b>Rear optical connectors</b>	:	5 SC/APC, other type on request
<b>Internal optical CWDM MUX/DEMUX</b>	:	2 max (option <b>MFL-DMX</b> )

### "ANT" mode RF TX characteristics

<b>Typical application</b>	:	RX antenna remoting
<b>Frequency ranges (front panel selectable)</b>	:	- 140 to 840 MHz (flat) - 470 to 840 MHz - 25MHz BW tunable band-pass filter (opt*) (center freq. in 1MHz step, from 404 to 788 MHz) - External user band-pass filter
<b>External filter loss compensation</b>	:	0 to 6 dB
<b>TX Gain</b>	:	0dB (user adjustable +6 to -20dB typ.)
<b>Input IP3</b>	:	> 16 dBm typ.
<b>Noise figure</b>	:	< 20dB typ. (*)
<b>SFDR</b>	:	> 116 dB/Hz <sup>2/3</sup> typ.
<b>RF input connector</b>	:	N female 50 Ω
<b>Antenna booster supply</b>	:	12Vdc 200mA max
<b>External filter connectors</b>	:	BNC female 50 Ω

### "ANT" mode RF RX characteristics

<b>RX Gain</b>	:	0dB (user adjustable ± 14dB typ.)
<b>Failsafe option</b>	:	yes, standard option
<b>RF output connector</b>	:	N female 50 Ω
<b>Failsafe connector</b>	:	BNC female 50 Ω

### "IFB" mode RF TX characteristics

<b>Typical application</b>	:	"IFB" signal remoting (isofrequency systems)
<b>Frequency range</b>	:	140 to 840 MHz
<b>RF input level</b>	:	- 6 to 10 dBm
<b>RF input level for 0dBm out (@ 0dB gain)</b>	:	from -3dBm to + 10dBm
<b>RF input connector</b>	:	N female 50 Ω

### "IFB" mode RF RX characteristics

<b>RX output level</b>	:	0 dBm (user adjustable +6 to -20dB typ.)
<b>Failsafe option</b>	:	yes, standard option
<b>RF output connector</b>	:	N female 50 Ω
<b>Failsafe connector</b>	:	BNC female 50 Ω

### Optical TX module (option MFL-TX module OTB001)

<b>Optical power</b>	:	3dBm (6dBm optional)
<b>Wavelengths</b>	:	1511 or 1531 or 1551 or 1571 nm
<b>Laser</b>	:	low noise, low distortion DFB laser

### Optical RX module (option MFL-RX module ORB001)

<b>Input optical power range</b>	:	-5 dBm to 5 dBm
<b>Wavelengths</b>	:	1490 to 1610 nm

### Temperature

<b>Operating temperature</b>	:	-20 to +55 °C
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### Powering

<b>AC mains</b>	:	90 to 240 Vac, 60VA max
<b>DC (option MFL-DC)</b>	:	10-28Vdc 3A frame floating

### Dimensions and weight

<b>Dimensions</b>	:	19"/1U, 430x44x370mm (Width x Height x Depth)
<b>Weight</b>	:	4,5 kg

(\*) Measured with "Ant" mode and 0 dB gain (standard "factory preset") at 25 °C

## DECLARATION OF CONFORMITY

**Manufacturer Name:** WISYCOM S.r.l.

**Manufacturer Address:** via Spin, 156  
36060 Romano d'Ezzelino (VI)  
Italy

### **Herewith we declare that**

Product Type : RF over fibre optical system for remote antenna reception of wireless microphone system

Product Name : MFL

Optional and Accessories : This declaration includes all the optionals and accessories included into the product.

### **We declare that the above mentioned product is compliant with 89/336/EEC EMC directive.**

- EN 60065 Safety requirements for mains operated electronic and related apparatus for household and similar general use.
- ETS 300 422 Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range.
- ETS 300 445 Radio Equipment and Systems (RES); Electro-Magnetic Compatibility (EMC) standard for wireless microphones and similar Radio Frequency (RF) audio link equipment.
- ETS 301 489 Electromagnetic Compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services.

The conformity is achieved by fulfilling the following European Standard(s):

Romano d'Ezzelino (VI)	10-JAN-2014
<b>Address</b>	<b>Data</b>

  
**WISYCOM s.r.l.**  
 Franco Maestrelli  
 Amministratore Unico

**ENVIRONMENTAL INFORMATION****Applicable in the European Union and other European countries with separate collection systems****Disposal of Old Electrical & Electronic Equipment (2002/96/EC)**

This symbol indicates that this products shall not be treated as household waste. Instead it shall be handed over to the appropriate collection point for the recycling of electrical and electronic equipment. The recycling of material will help to conserve natural resources.

**ITALY ONLY****Obblighi di informazione agli utilizzatori**

ai sensi dell'art. 13 del Decreto Legislativo 25 luglio 2005, n. 151 "Attuazione delle Direttive 2002/95/CE, 2002/96/CE e 2003/108/CE, relative alla riduzione dell'uso di sostanze pericolose nelle apparecchiature elettriche ed elettroniche, nonché allo smaltimento dei rifiuti"

**Smaltimento di apparecchiature elettriche ed elettroniche di tipo professionale**

Il simbolo del cassetto barrato riportato sull'apparecchiatura o sulla sua confezione indica che il prodotto alla fine della propria vita utile deve essere raccolto separatamente dagli altri rifiuti.

La raccolta differenziata della presente apparecchiatura giunta a fine vita è organizzata e gestita dal produttore. L'utente che vorrà disfarsi della presente apparecchiatura dovrà quindi contattare il produttore e seguire il sistema che questo ha adottato per consentire la raccolta separata dell'apparecchiatura giunta a fine vita.

L'adeguata raccolta differenziata per l'avvio successivo dell'apparecchiatura dismessa al riciclaggio, al trattamento e allo smaltimento ambientalmente compatibile contribuisce ad evitare possibili effetti negativi sull'ambiente e sulla salute e favorisce il reimpiego e/o riciclo dei materiali di cui è composta l'apparecchiatura. Lo smaltimento abusivo del prodotto da parte del detentore comporta l'applicazione delle sanzioni amministrative previste dalla normativa vigente.

Iscrizione al Registro A.E.E. n. IT09100000006319



**WISYCOM<sup>®</sup>**

Wireless System Communications

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